



## CT Instrumentation

### Multiple Choice

Identify the choice that best completes the statement or answers the question.

- \_\_\_ 1. All of the following are major systems in the basic equipment configuration for computed tomography (CT) *except*:
- imaging system.
  - computer system.
  - image display, recording, storage, and communication system.
  - dictation system.
- \_\_\_ 2. The purpose of the imaging system is to perform all of the following *except*:
- detect and measure the radiation passing through the cross-section.
  - produce X-rays.
  - store images for retrieval.
  - shape and filter the X-ray.
- \_\_\_ 3. Which of the following does the computer system perform?
- Detects radiation
  - Image manipulation
  - Display the output image
  - Provides a hard copy
- \_\_\_ 4. The computer system receives \_\_\_\_\_ data from the data acquisition system.
- analog
  - digital
  - manipulated
  - hard copy
- \_\_\_ 5. Which of the following is part of the imaging system?
- The CT control console
  - The X-ray tube and detectors
  - The cathode ray tube display device
  - The central processing unit (CPU)
- \_\_\_ 6. The imaging system components are located in the:

- a. scanner room.
  - b. radiologist viewing area.
  - c. operator room.
  - d. computer room.
- \_\_\_ 7. The computer system for CT includes all of the following *except*:
- a. detector electronics.
  - b. input-output devices.
  - c. the CPU.
  - d. array processors and back-projector.
- \_\_\_ 8. All of the following are purposes of the image display, recording, storage, and communication system *except*:
- a. displays the output digital image.
  - b. provides a hard copy.
  - c. facilitates storage.
  - d. enables scanning procedures.
- \_\_\_ 9. Which of the following is where images are stored in a filmless imaging department?
- a. Hospital information system
  - b. Radiology information system
  - c. Picture archiving and communications system (PACS)
  - d. Data acquisition system
- \_\_\_ 10. The X-ray generator for CT scanners is usually a:
- a. single-phase, half-wave rectified unit.
  - b. high-frequency unit.
  - c. three-phase, six-pulse generator.
  - d. three-phase, 12-pulse generator.
- \_\_\_ 11. The design that incorporates the high-voltage generator on the rotating frame of the CT gantry eliminates:
- a. the need for long high-tension cables.
  - b. the need for short high-tension cables.
  - c. the detectors from within the gantry.
  - d. the need for any cables.
- \_\_\_ 12. The opening in the gantry in which the patient is positioned during scanning is called the:
- a. rotating frame.
  - b. isocenter.
  - c. gantry aperture.
  - d. positioning hole.
- \_\_\_ 13. Most scanners have a gantry aperture of about:
- a. 70 mm.
  - b. 70 inches.
  - c. 100 cm.
  - d. 70 cm.

- \_\_\_ 14. The ideal couch top (table top) of a CT scanner table has all of the following features *except*:
- low radiation absorption characteristics.
  - excellent vibration-damping features.
  - carbon fiber design.
  - limited horizontal and vertical movements.
- \_\_\_ 15. The typical matrix size of a typical CT image is:
- $32 \times 32 \times 8$  bytes deep.
  - $128 \times 128 \times 8$  bytes deep.
  - $56 \times 256 \times 10$  bytes deep.
  - $512 \times 512 \times 8$  bytes deep.
- \_\_\_ 16. All of the following media forms can be used to store CT images *except*:
- VHS tapes.
  - magnetic disks.
  - laser optical disks.
  - digital videotape.
- \_\_\_ 17. Which room generally houses the gantry and patient couch and should be large enough to accommodate gurneys and emergency equipment?
- Scanning room
  - Computer room
  - Control room
  - Digital room
- \_\_\_ 18. The CT gantry houses all of the following *except*:
- the X-ray tube and generator.
  - the CPU.
  - the detector electronics.
  - collimators.
- \_\_\_ 19. Which of the following supports the patient during a CT examination?
- Life-support equipment
  - The technologist and radiologist
  - The gantry aperture
  - The CT table or patient couch
- \_\_\_ 20. The following are accessories for a CT scanner *except*:
- axial head holder.
  - knee support pad.
  - array processor.
  - pediatric cradle.

## CT Instrumentation Answer Section

### MULTIPLE CHOICE

1. ANS: D  
Three major systems of CT are the imaging system, computer system, and image display, recording, storage, and communication system.  
  
PTS: 1                    REF: p. 139
2. ANS: C  
The purpose of the imaging system is to produce X-rays, shape and filter the X-ray beam to pass through only a defined cross-section of the patient, detect and measure the radiation passing through the cross-section, and convert the transmitted photons into digital information.  
  
PTS: 1                    REF: p. 139
3. ANS: B  
The computer system performs image manipulation and various image processing operations.  
  
PTS: 1                    REF: p. 141
4. ANS: B  
The computer system receives the digital data from the data acquisition system and processes it to reconstruct an image of the cross-sectional anatomy.  
  
PTS: 1                    REF: p. 141
5. ANS: B  
The major components of the imaging system are the X-ray tube and generator, collimators, filter, detectors, and detector electronics.  
  
PTS: 1                    REF: p. 139
6. ANS: A  
The imaging system is located in the scanner room.  
  
PTS: 1                    REF: p. 139
7. ANS: A  
The computer system generally includes input-output devices, CPUs, array processors, interface devices, back-projector processors, storage devices, and communications hardware.  
  
PTS: 1                    REF: p. 141
8. ANS: D  
The image display, recording, storage, and communication system do not enable scanning procedures.  
  
PTS: 1                    REF: p. 141
9. ANS: C  
The filmless imaging department now stores images in the PACS.  
  
PTS: 1                    REF: p. 141

10. ANS: B  
The generator in the gantry is usually a small, solid-state, high-frequency generator mounted on the rotating scan frames.
- PTS: 1 REF: p. 142
11. ANS: A  
The high-voltage generator is located close to the X-ray tube, only a short high-tension cable is required to couple the X-ray tube and generator. This design eliminates external X-ray control cabinets and long high-tension cables as was typical of older CT imaging systems.
- PTS: 1 REF: p. 142
12. ANS: C  
The gantry aperture is the opening in which the patient is positioned during the scanning procedure. The technologist can approach the patient from both the front and back of the gantry.
- PTS: 1 REF: p. 142
13. ANS: D  
Most scanners have a 70-cm aperture that facilitates patient positioning and helps provide access to patients in emergency situations.
- PTS: 1 REF: p. 142
14. ANS: D  
The couch top is usually made of carbon fiber composites because they have low absorption and provide excellent vibration-damping features and meet the strength requirements necessary to take images of heavy patients. The vertical movement should provide a range of heights to make it easy for patients to mount and dismount the table. Horizontal or longitudinal couch movements should enable the patient to be scanned from head to thighs without repositioning.
- PTS: 1 REF: p. 142 | p. 143
15. ANS: D  
CT image size varies according to the anatomy being examined. A typical CT image has a matrix size of  $512 \times 512 \times 8$  bytes.
- PTS: 1 REF: p. 148
16. ANS: A  
Storage devices for CT include magnetic tape and disks, digital videotape, optical disks, and optical tape.
- PTS: 1 REF: p. 148
17. ANS: A  
The scanning room houses the gantry and patient couch. This room should be large enough to accommodate gurneys and emergency equipment.
- PTS: 1 REF: p. 154
18. ANS: B  
The gantry houses imaging components such as the slip rings, X-ray tube, high-voltage generator, collimators, detectors, and data acquisition system.

PTS: 1                    REF: p. 141

19. ANS: D

The patient couch, or patient table, provides a platform on which the patient lies during the examination; it should be strong and rigid to support the weight of the patient.

PTS: 1                    REF: p. 142

20. ANS: C

CT accessories include pediatric cradles, arm and leg supports, elevated and flat head holders, table mattresses, side rails, table extenders, knee supports, head pillows with hand rests, axial and coronal head holders, and radiation therapy table tops, to mention only a few. Array processors are part of the computer system and are not considered accessories.

PTS: 1                    REF: p. 154